

**KENWOOD**  
HI/FI STEREO COMPONENTS

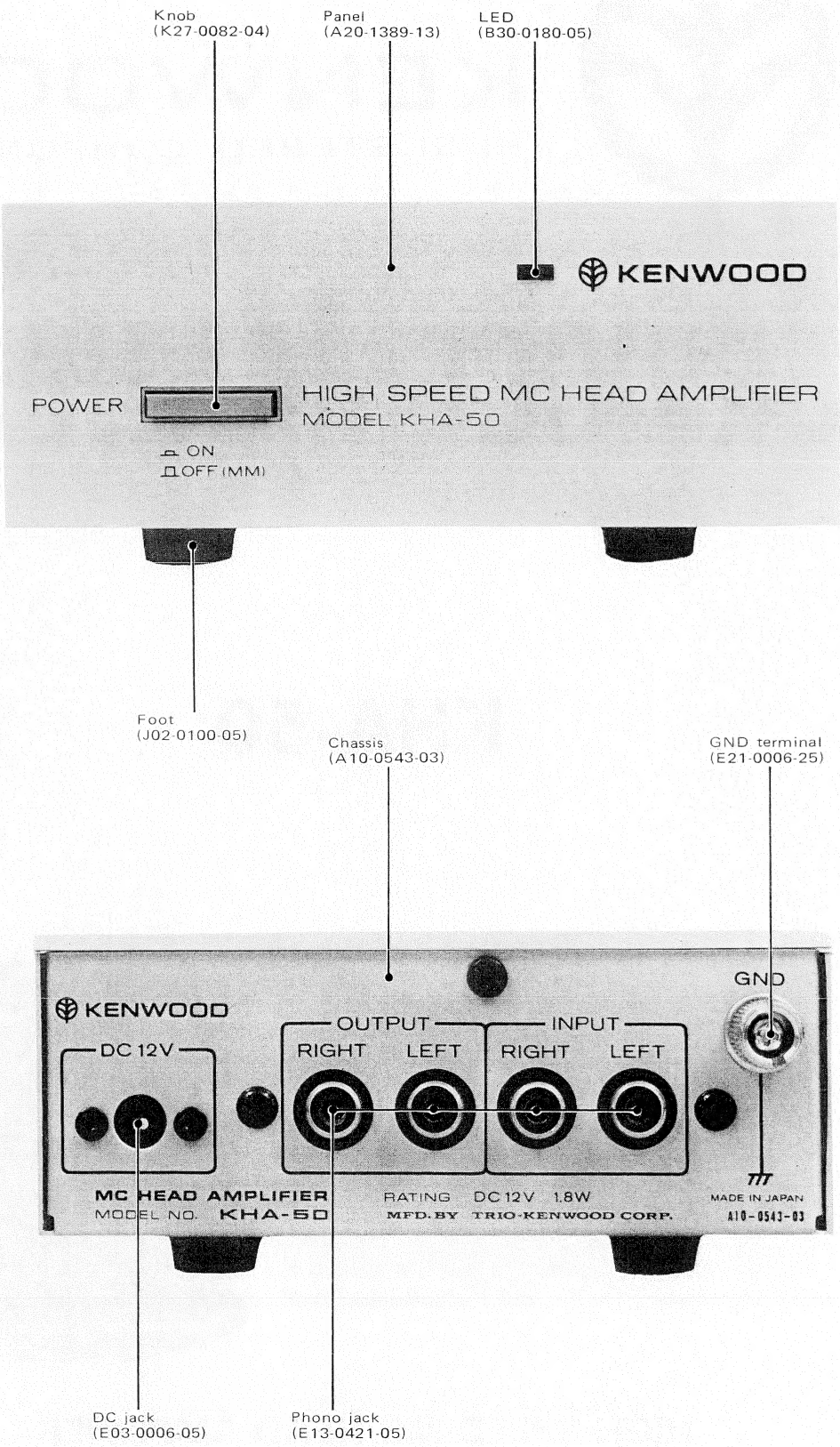
# SERVICE MANUAL

## KHA-50

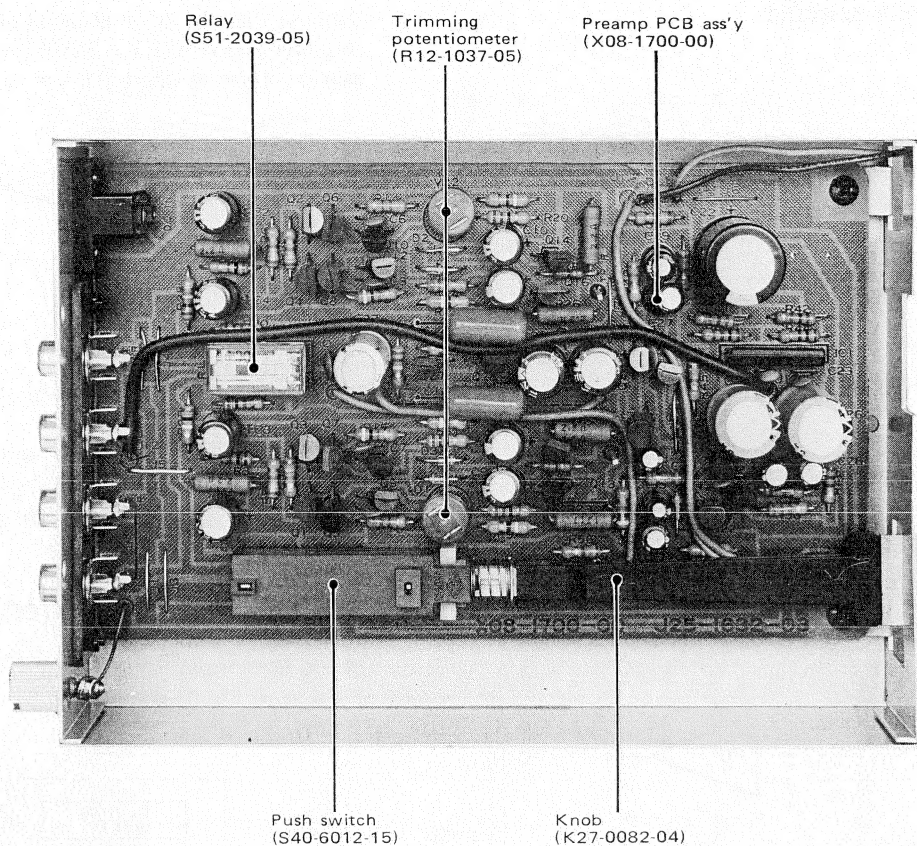


**HIGH SPEED MC HEAD AMPLIFIER**

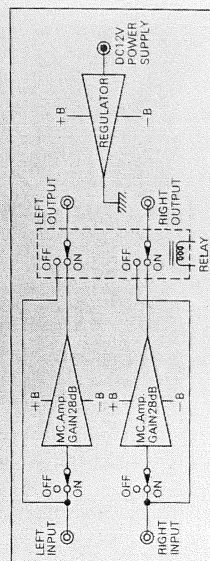
**EXTERNAL VIEW**



# INTERNAL VIEW



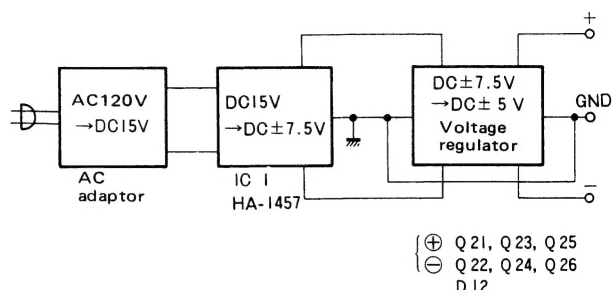
**SPECIFICATION**  
 Frequency Response 5 to 54KHz  $\pm 0.5$  dB  
 Input Noise Level  $-155$  dBV  
 Total Harmonic Distortion 0.005%/20 to 20KHz  
 Rise Time 0.07  $\mu$ sec. Slew Rate 80V/ $\mu$ sec.





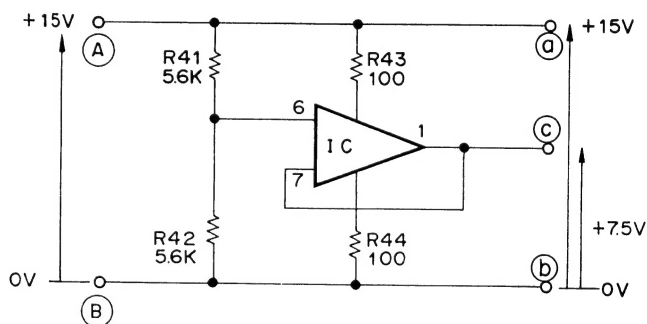
## CIRCUIT DESCRIPTION

### POWER SUPPLY CIRCUIT

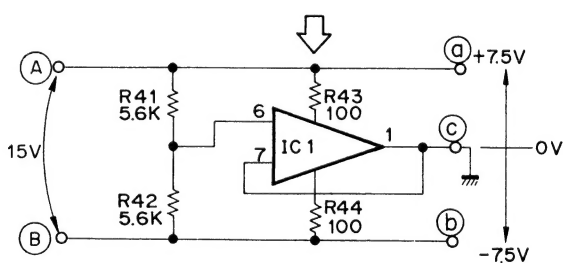


< Fig. 1 Power Supply Circuit >

The IC (HA-1457) is a low noise differential amplifier to make positive and negative power voltages. This IC is normally used in equalizer circuits.



< Fig. 2-a >

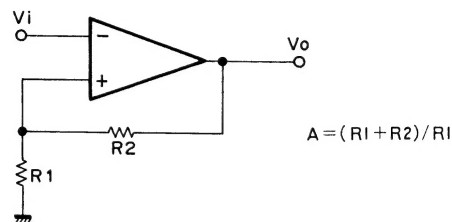


< Fig. 2-b >

Referring to Fig. 2-a, when the point ② is grounded, a voltage of +15 V is fed at the point ① and a voltage of +7.5V, a half of 15 V, at the pin 6. Being of a differential type, this IC provides the same voltage to the pin 6 and pin 7. Since the pin 7 is directly connected to the pin 1, the voltage at the pin 1 is also the same.

Consequently, the output voltage at the pin 1 is the same as the voltage (7.5 V) at the pin 6. When the point ② on the output side is grounded, the point ① is given +15 V and the point ③ +7.5 V.

Suppose that the IC is an amplifier having a gain of "1", then the gain  $A = (R1 + R2)/R1$  as shown in Fig. 3. This gain is 1 ( $A = 1$ ) where  $R1 = \infty$  and  $R2 = 0$ .

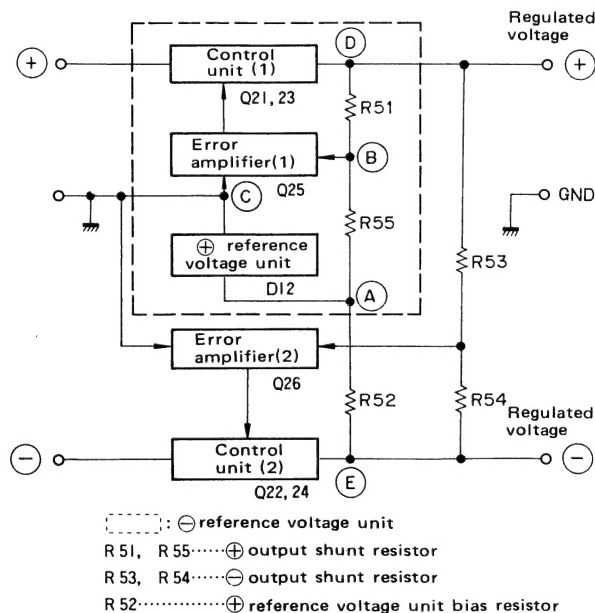


< Fig. 3 >

The outputs at the point ① and point ② are +7.5 V and -7.5 V respectively with regard to the point ③ as shown in Fig. 2-b. Note that the point ② on the input side is not grounded.

### POWER VOLTAGE REGULATOR

The power voltage regulator used in the KHA-50 is composed of a reference voltage unit, error amplifier and control unit.



< Fig. 4 >

As will be understood from Fig. 4, the  $\oplus$  voltage is first regulated, then the  $\ominus$  voltage using the regulated  $\oplus$  voltage as a reference. The  $\oplus$  reference voltage (5 V) is applied to between the points ① and ③ through the zener diode, D12. The error amplifier (1) is of NPN type, so a voltage (0.6 V) is present between the points ③ and ②, thereby applying the voltage (about 5.6 V) to between the



## CIRCUIT DESCRIPTION

points ① and ②.

As the current in R55 is equal to that in R51, the voltage between the points ① and ② is:

$$V_{①②} = V_{③④} \times (R51 + R55)/R55 \\ \approx 10.7 \text{ V}$$

Therefore, the output voltage  $V_{⑤⑥}$  is:

$$V_{⑤⑥} = V_{①②} - V_{③④} \approx 5.1 \text{ V}$$

The ③ voltage can be obtained in the same manner (reference voltage:  $V_{⑤⑥}$ ). The output voltage  $V_{⑦⑧}$  is:

$$V_{⑦⑧} \approx -5.0 \text{ V}$$

The control units (1 and 2) are of the Darlington connection. The ripple filter composed of C25-30, C33 and C34 is used to minimize the noise in the circuit.

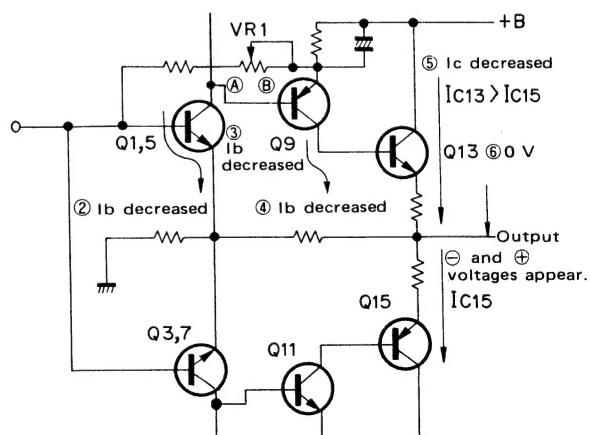
Although the variation in the ③, power supply voltage has no effects on the ① voltage, the variation in the ①, voltage affects the ③ output voltage.

## ADJUSTMENT

### OFFSET ADJUSTMENT AND FUNCTIONS

To adjust the offset, connect a voltmeter to the test point, TP on the preamplifier circuit board, then adjust the trimming potentiometers VR1 and 2 (3.3 k $\Omega$ ) for DC 0 V (see the diagram on printed circuit board).

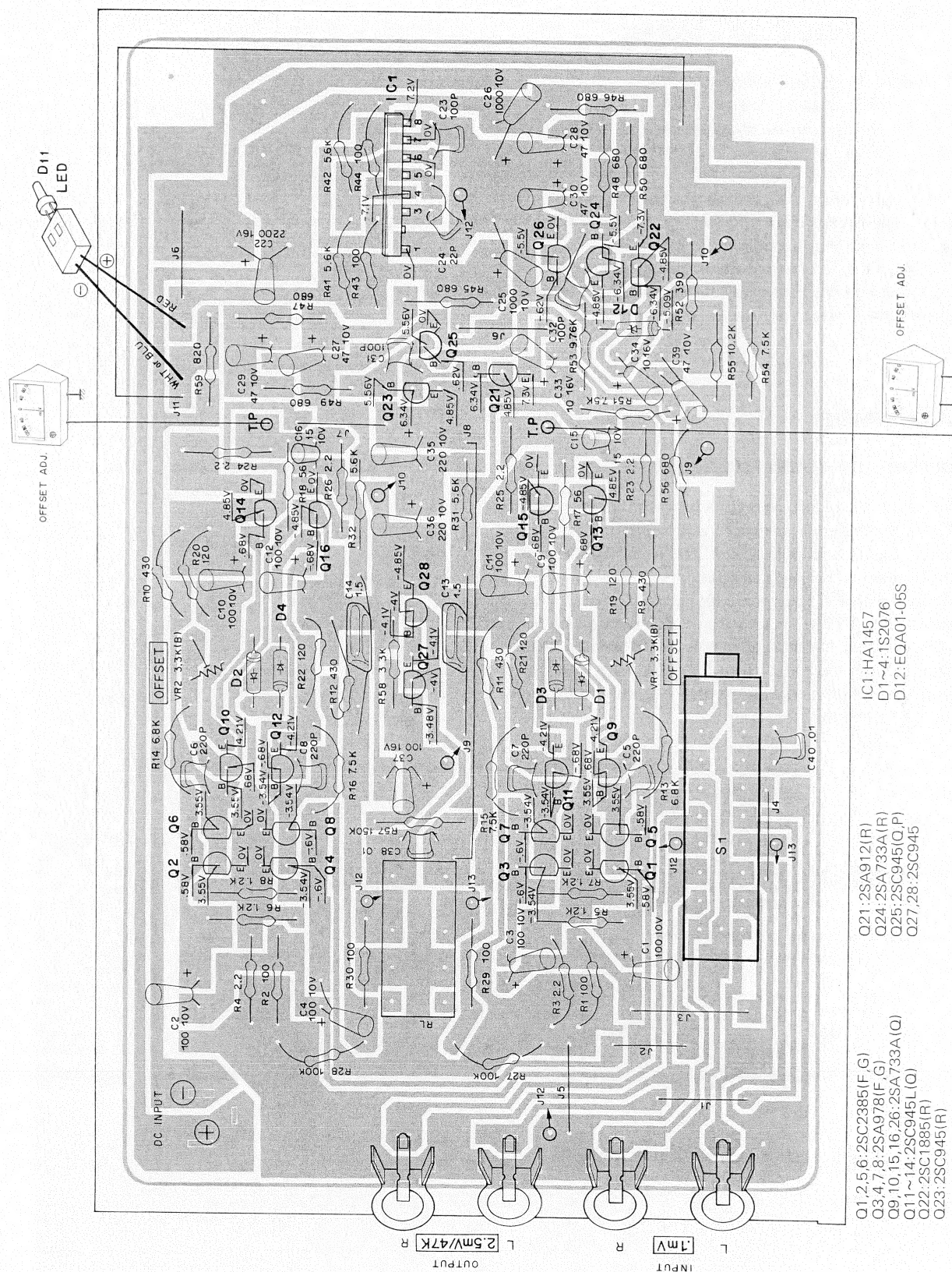
When a positive voltage is present on TP, Ic13 is greater than Ic15. To reduce Ic13, turn VR1 in the ② direction. This increases the bias resistances of Q1 and Q5 which, in turn, reduces the base current to a large extent. In contrast with this, when a negative voltage is present, turn VR1 in the ① direction

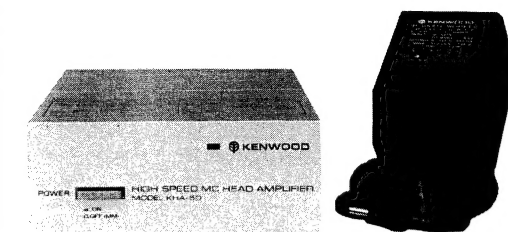
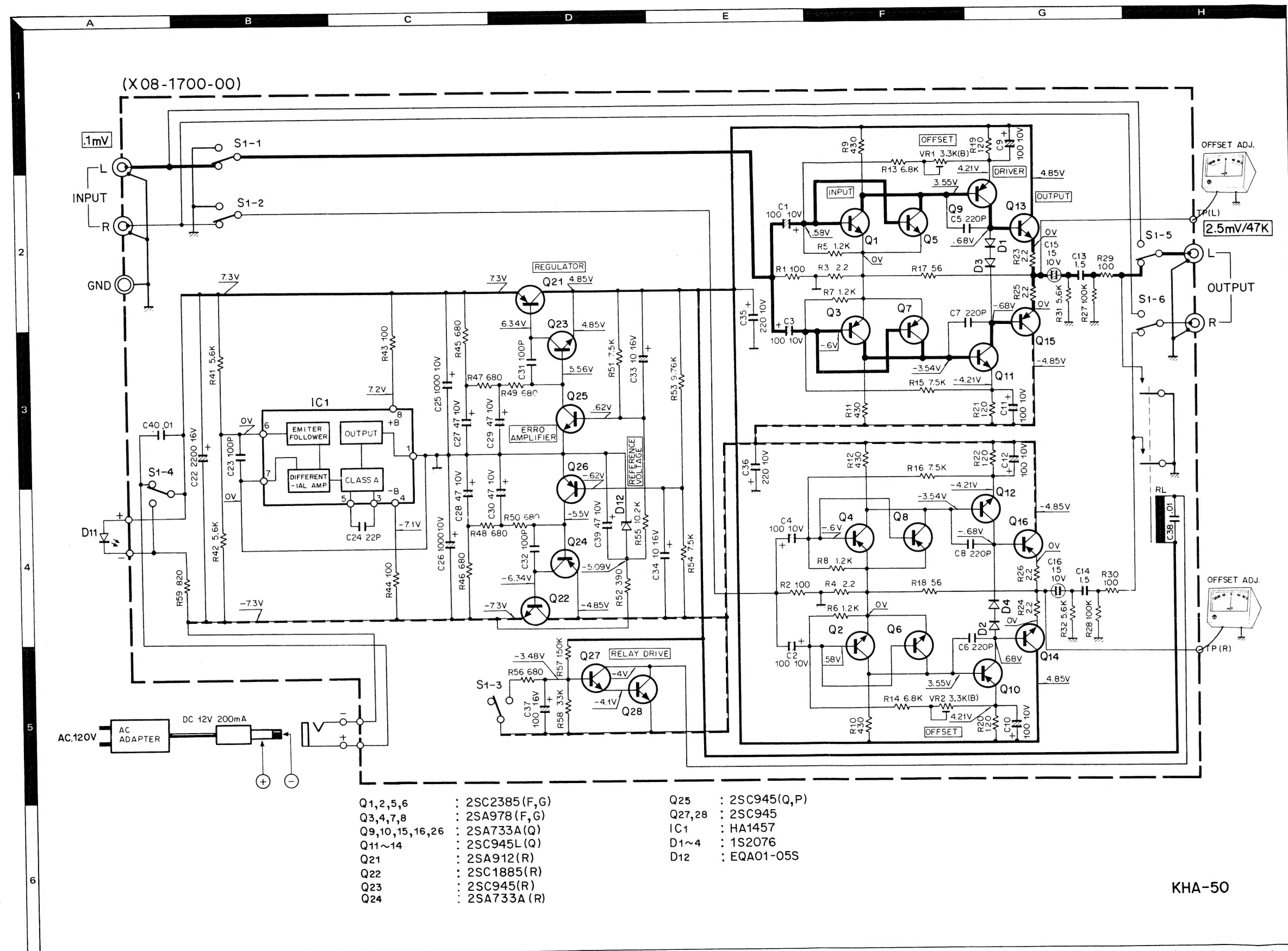


< Fig. 5 ⊕ Voltage on Output Terminal >

## PC BOARD

### Components Side





### SPECIFICATIONS

<b>Input Sensitivity and Impedance</b>	
PHONO (MC) . . . . .	0.1 mV, 100 ohms
<b>Output Level and Impedance</b>	
Rated Output . . . . .	2.5 mV at 100 ohms
Maximum Output . . . . .	1.5 V
<b>Frequency Response</b>	. . . . . From 5 Hz to 2 MHz, +0 dB, -3 dB
<b>Total Harmonic Distortion</b>	. . . . . 0.005% at Maximum Output
	. . . . . from 20 Hz to 20 kHz
<b>Signal to Noise Ratio (IHF-A)</b>	. . . . . .75 dB at rated output
<b>Equivalent Input Noise Level (IHF-A)</b>	. . . . . -155 dBV
<b>Maximum Input Level for PHONO (MC)</b>	. . . . . 60 mV (RMS), T.H.D. 0.005% at 1 kHz
<b>Transient Response</b>	
Rise Time..	0.12 $\mu$ s (less than 2 V peak to peak)
Slew Rate . . . . .	$\pm 40$ V/ $\mu$ s
<b>Power Supply (AC Adaptor)</b>	
(For U.S.A.)	
Model . . . . .	28A-4105
Input . . . . .	AC 120 V, 60 Hz 5 W
Output . . . . .	DC 12 V, 200 mA
(For Europe)	
Model . . . . .	KHA-50PS
Input . . . . .	AC 220 V~, 50/60 Hz 6 VA
Output . . . . .	DC 12 V $\pm$ 200 mA
Protector . . . . .	T500 mA
Supplied Accessory . . . . .	1 Connecting Cord

**Note:**  
 Kenwood follows a policy of continuous advancements in development. For this reason specifications may be changed without notice.

DC voltage measured with 20 k $\Omega$ /V VOM under no signal.



PARTS LIST

☆ : new parts

Ref. No.	Parts No.	Description	Re- marks
TOTAL			
—	A10-0543-03	Chassis	☆
—	A20-1389-13	Panel	☆
—	B07-0253-04	Escutcheon	☆
D11	B30-0180-05	LED (green)	☆
—	B42-0009-04	Passed sticker	
—	B42-0473-24	Serial No. sticker	
—	B46-0055-20	Warranty card	P
—	B46-0061-20	Warranty card	K
—	B50-1828-00	Instruction manual	K, E
—	B50-1829-00	Instruction manual	P
—	E21-0006-25	GND terminal	
—	E30-0606-05	Audio cord	☆
—	H01-1856-03	Carton box	K, E
—	H01-1900-03	Carton box	P
—	J02-0100-05	Foot	☆
—	J19-0534-04	LED holder	☆
—	K27-0082-04	Knob	
—	W09-0011-05	AC adaptor	K, P
—	W09-0012-05	AC adaptor	E
—	X08-1700-00	Preamp PCB ass'y	☆
PREAMP PCB ASS'Y (X08-1700-00)			
C1~4	C24-1010-71	Electrolytic 100μF 10WV	
C5~8	C71-1722-15	Ceramic 220pF ±5%	
C9~12	C24-1010-71	Electrolytic 100μF 10WV	
C13,14	C91-0068-05	Film 1.5μF 100WV	
C15,16	C26-1015-67	Non-pole electrolytic 15μF 10WV	
C22	C90-0390-05	Electrolytic 2200μF 16WV	☆
C23	C71-1710-15	Ceramic 100pF ±5%	
C24	C71-1722-05	Ceramic 22pF ±5%	
C25,26	C24-1010-81	Electrolytic 1000μF 10WV	
C27~30	C24-1047-61	Electrolytic 47μF 10WV	
C31,32	C71-1710-15	Ceramic 100pF ±5%	
C33,34	C24-1210-61	Electrolytic 10μF 16WV	
C35,36	C24-1022-71	Electrolytic 220μF 10WV	
C37	C25-1210-77	Electrolytic 100μF 16WV	
C38	C55-1710-38	Ceramic 0.01μF +100%,—0%	
C39	C24-1047-61	Electrolytic 47μF 10WV	
C40	C55-1710-38	Ceramic 0.01μF +100%,—0%	
—	E03-0006-05	DC jack	
—	E13-0421-05	Phono jack (gold-plated)	
VR1,2	R12-1037-05	Trimming potentiometer 3.3kΩ(B) Offset	
R17,18	R48-6256-05	RN 56Ω ±5% 1/4W	
R53	R48-2976-14	RN 9.76kΩ ±2% 1/4W	
R55	R48-2102-24	RN 10.2kΩ ±2% 1/4W	
S1	S40-6012-15	Pushbutton switch	☆
RL	S51-2039-05	Relay	☆
Q1,2	V03-2385-10	Transistor 2SC2385(F,G)	
Q3,4	V01-0978-10	Transistor 2SA978(F,G)	
Q5,6	V03-2385-10	Transistor 2SC2385(F,G)	
Q7,8	V01-0978-10	Transistor 2SA978(F,G)	
Q9,10	V01-0733-50	Transistor 2SA733A(Q)	
Q11~14	V03-0945-50	Transistor 2SC945(L)(Q)	
Q15,16	V01-0733-50	Transistor 2SA733A(Q)	
Q21	V01-0912-30	Transistor 2SA912(R)	
Q22	V03-1885-20	Transistor 2SC1885(R)	

Ref. No.	Parts No.	Description	Re- marks
Q23	V03-0316-05	Transistor 2SC945(R)	
Q24	V01-0733-70	Transistor 2SA733A(R)	
Q25	V03-0348-05	Transistor 2SC945(Q,P)	
Q26	V01-0733-50	Transistor 2SA733A(Q)	
Q27,28	V03-0297-05	Transistor 2SC945	
D1~4	V11-0271-05	Diode 1S2076	
D12	V11-0462-05	Zener diode EQA01-05(S)	
IC1	V30-0264-10	IC HA1457	

SEMICONDUCTOR SUBSTITUTIONS

Semiconductor Name	Semiconductor Substitutions
2SA733A(Q,P)	2SA872(D), 2SA899(B,G), 2SA915(K,L,M), 2SA992(P), 2SA921(R)
2SA733A(R)	2SA915(M), 2SA899(B,G)
2SA912(R)	2SA921(R), 2SA915(L,M), 2SA899(B,G)
2SA978(F,G)	—
2SC945(Q,P)	2SC1845(P), 2SC1980(R), 2SC1940(K,L,M), 2SC1904(B)
2SC945(R)	2SC1904(B,G), 2SC1940(M)
2SC1885(R)	2SC1980(R), 2SC1940(M), 2SC1904(B)
2SC2385(F,G)	—

A product of  
**TRIO-KENWOOD CORPORATION**  
6-17, 3-chome, Aobadai, Meguro-ku, Tokyo 153, Japan

**KENWOOD ELECTRONICS, INC.**  
1315 E. Watsoncenter Rd. Carson, California 90745  
75 Seaview Drive, Secaucus, New Jersey 07094, U.S.A.  
**TRIO-KENWOOD ELECTRONICS, N.V.**  
Leuvensesteenweg 184 B-1930 Zaventem, Belgium  
**TRIO-KENWOOD ELECTRONICS GmbH**  
Rudolf-Braas-Str. 20, 6056 Heusenstamm, West Germany  
**TRIO-KENWOOD FRANCE S.A.**  
5, Boulevard Ney, 75018 Paris, France  
**TRIO-KENWOOD SVENSKA AB**  
Kemistvagen 10A, S-183 21 Taby, Sweden  
**TRIO-KENWOOD (AUSTRALIA) PTY. LTD.**  
30 Whiting St., Artarmon, N.S.W. 2064, Australia  
**KENWOOD & LEE ELECTRONICS, LTD.**  
Room 501, Wang Kee Building, 5th Floor, 34-37, Connaught Road, Central, Hong Kong